Emerging Themes in Inter-firm Collaboration

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Abstract

Whether between individuals, work groups or organisations, it is widely accepted that collaboration plays an important role in the process of knowledge creation and maintenance.

Management journals began reporting case study and other research results on collaboration between firms in the 1980's. The early focus of these papers was on joint ventures and strategic alliances. More recently, research results on collaborative research and development activities and innovation networks and clusters have been reported in those journals.

As much of the research has been case study based, the literatures on inter-firm collaboration and innovation clusters is fragmented. To date, no obvious attempt has been made to draw the lessons learned into a cogent, understandable, pragmatic and readily applicable summary.

With a bias towards knowledge as a "capacity to act" (and that capacity's maintenance and development), the paper identifies the underlying themes that have emerged in the relevant literature of the past 25 years. Three key understandings will be developed: apparent "best practice" in inter-firm collaboration; the conditions precedent (and hurdles) to successful knowledge collaborations and the key challenges that exist for management in collaborative environments.

Keywords: Collaboration, inter-firm collaboration, innovation networks, alliances, knowledge management

Introduction

Strategic Alliance. Joint Venture. Collaboration. For the purpose of this paper, they are treated as variations on the same theme: some sort of cooperative activity beyond the simple transaction, undertaken by two or more parties with planned positive outcomes for the participants. The arrangements yield benefits for the participants – not just a deal or transaction, but a living and evolving system (Kanter, 1994). She identified a continuum of arrangements from the loose and distant (as in mutual service consortia) to strong and close arrangements found in value chain partnerships.

Over the past twenty years or so the results of research on alliances (in its various forms) has been reported in the literature. That research covers the field from strategic alliances, through joint ventures and of more recent time to collaborative arrangements covering R&D and the establishment of innovation clusters. The purpose of this paper is to examine that literature to

- Understand why firms enter into these types of arrangements;
- Summarise the conditions precedent for successful collaborations;
- Review some of the network issues identified in the literature;

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- Identify what might be considered as best practice in collaboration management;
- The challenges managers have in managing in this environment.

Anand & Khanna (2000) describe alliances as complex organisational forms that are usefully viewed as incomplete contracts with successful outcomes dependent on the ability to anticipate and respond to contingencies that cannot be prespecified in a formal contract. Trust between parties is a partial substitute for contract and leads to lower transaction costs and limits risk (Ingham & Mothe, 1998).

It appears that these cooperative arrangements form along one of two distinct paths. Emergent processes develop through changes in the environment, a common interest and similar views about the environment amongst members. Engineered processes develop when a triggering entity recruits potential members with complimentary competencies to tackle a problem (Doz, Olk & Smith Ring 2000). Emergent processes enable members with similar interests to generate consensus on their domain of interest and leads to strong expectations of continuity. In the initial stages, engineered processes will adopt a hub and spoke approach to member recruitment. Emergent processes are associated with exploitative managerial behaviours; engineered processes with explorative management behaviour.

Why alliances or collaborative arrangements?

As the operating environment becomes more discontinuous, the more impossible it is to do everything in-house (Limerick, Cunnington & Crowther, 2002). This is particularly the case where there is a regime of rapid technological development with broadly distributed research breakthroughs ((Powell, Koput & Smith-Doerr, 1996). The very nature of this discontinuity is that no organisation's history (and therefore all its resources) will prepare it for the future (Limerick, Cunnington & Crowther, 2000). Further, alliances provide firms with a unique opportunity to leverage their strengths with the help of partners (Inkpen, 1996). Alliance knowledge can be used by the "parents" to enhance their own strategy and operations in areas that are unrelated to the alliance activities ((Inkpen 2000). Alliances, in whatever form, can also help spread the risks of capital investment, innovation and shrinking product life cycles (Mowery, Oxley & Silverman, 1996).

Strategic alliances or collaborations are essentially about learning (Child & Faulkner, 1998). From a learning perspective, organisations grow when there is a shared understanding involving the organisation, its environment and the relationship between the two involving an intimate relationship between understanding and action (Inkpen & Crossan, 1995).

Knowledge is intangible, boundaryless and dynamic and cannot be inventoried – it has to be exploited where and when it is needed to create value (Nonaka & Nishiguchi, 2001).

There has been a shift in the strategic thinking around knowledge flows within alliances or collaborations. Initial research revealed that firms entered alliances with the thought of acquiring partner capabilities. Rather than using alliances to acquire capabilities, the thinking moved to gaining access to other firms' capabilities and competencies (Mowery,

Oxley & Silverman, 1996). This move probably resulted from firms understanding that the accessibility and transferability of alliance knowledge to the "parent" was negatively related to the tacitness of alliance knowledge (Inkpen, 2000). Further, Kale, Singh & Perlmutter (2000) found that as well as accessing useful information or know how from partners, participants would also try to internalise complimentary partner capabilities and skills. This evolved to understanding that while collaborations can facilitate the transfer of extant knowledge from one organisation to another, it can also create new knowledge that neither of the collaborators previously possessed (Hardy, Phillips & Lawrence, 2003). An interesting aspect is that cooperation can engender capabilities within the relationship itself, such that parties develop principles of coordination that improve the joint performance (Kogut, 2000). In their famous work, Nonaka & Takeuchi (1995) include interfirm knowledge creation as part of their SECI model.

Access to external knowledge impacts a firm's value. The most tangible expression is the compelling evidence that rapid product development depends on the reliance on outside suppliers and that part of a firm's value can be imputed to the capability of its embedded network (Kogut, 2000). As Simonin (1997) points out, collaborations have both tangible and intangible benefits: the tangible (or strategic/financial) of additional profits, improved market share or sustained competitive advantage and the intangible (or learning/knowledge based) of learning specific skills and competencies, interfirm cooperation, learning how to behave collaboratively and learning how to learn from collaborators.

In their study on Toyota production networks, Dyer & Noboeka (2000) reported that organisations involved in the network learned, not only by observing and importing the practices of other network members but also through the collaboration itself. The learning routines established through the Toyota production network provided a regular pattern of interactions among individuals that permitted the transfer, recombination or creation of specialised knowledge.

The intangible benefits to the alliance partners or collaborators can be viewed as three types of learning (Kale, Singh & Perlmutter, 2000). First, collaborators are able to access and internalise some of the specialised knowledge of their alliance partners. Next, collaborators learn from each other about managing the collaboration process. Last, they can learn about how better to manage alliance relationships. Being a good partner has become a key corporate asset (Kanter, 1994) in what she calls collaborative advantage.

Conditions precedent to success

For these alliances or collaborations to exist they must address either or both of the efficiency or effectiveness goals of the parties (Jarillo, 1988). The larger the gap between present and expected knowledge, the higher the motivation to learn at both the individual and organisation level will be (Ingham & Mothe, 1998). These networks of collaboration provide entry to a field in which the relevant knowledge is widely distributed and not as easily produced inside the boundaries of the firm or obtained through market transactions (Powell, Koput & Smith-Doerr, 1996).

Precedents to success are mostly related to three management issues or behaviours.

Trust between parties is critical for alliance success (Child & Faulkner, 1998) and partners must be truthful about their real intent in entering or maintaining an alliance arrangement (Inkpen & Li, 1999). Establishment of trust will reduce the need for firm's to protect themselves from the potential of partners' opportunistic behaviour and is a critical component of both efficiency and effectiveness goals (Jarillo, 1988). Kale, Singh and Perlmutter (2000) describe trust as a type of expectation that alleviates the fear that exchange partners will act opportunistically. It has two components: a structural component formed by the "mutual hostage" component and a behavioural component that involves the degree of confidence each party has in the others' reliability and integrity (Madhok, 1995). Knowledge based trust emerges as firms interact with each other and from that learn about each other. This develops norms of equity. Deterrence based trust revolves around the available sanctions for opportunistic behaviour (Gultai 1995).

However, Limerick, Cunnington & Crowther (2002) point out that the trust relationship within alliances has a hard, pragmatic edge: it is reciprocal and is based on a set of understandings between the parties about the expected behaviour of each party. In this important area they refer to Zalezniks (1989) comparison of the term trust with the idea of 'amitica'.

> *Unlike the bond of trust, 'amitica' is not open-ended or unconditional. Implicit in 'amitica' are the conditions that people accept obligations and are committed to their fulfilment, but never to the degree that one person in the relationship will expect the other to endure harm and neglect self-interest. Obligations are mutual and therefore one member does not ask for conduct that will create an imbalance.*

The issue of trust has been much studied in the literature. There are several important findings.

- The greater the trust between partners, the greater the openness in information sharing and the more likely alliance knowledge will be accessible (Inkpen 2000).

- Previous cooperative ties between the parties is positively associated with the development of interfirm trust (Inkpen 2000)

- Clarity in collaborative objectives fosters initial trust between partners (Inkpen & Currall 2004).

- The greater the initial level of trust, the lower the initial monitoring or control costs incurred by the alliance and the greater the initial reliance on social controls (Inkpen & Currall 2004)

- The more extensive the use of formal controls, the slower the development of interfirm trust (Inkpen & Currall 2004)

- Repeated transactions between the partners that are viewed as successful will lead to increased to interfirm trust (Inkpen & Currall 2004).

Nonaka & Nishiguchi (2001) stress the need for senior management to establish a knowledge vision for the collaboration and empower those in their organisation to achieve it. This is dealt with further in the section on best practice. Building to that knowledge vision, several authors have identified critical preliminaries in venture formation. In particular:

- Inter alia, Kanter (1989) stresses that participants must treat the relationship as important, understand the interdependent nature of that relationship and what that recognition involves, is fully informed both in the formation of the alliance and during its operation and institutionalises the arrangements in its own culture adding in a later article (Kanter 1994) the need to act with integrity in the relationship.

- Assessing the value of partner knowledge and it accessibility, tacitness and ease of transfer was seen by Inkpen (1998) as being important pre-alliance activities. This would be supported by establishing the knowledge (activity) connections between the partners and ensuring that partner and alliance management cultures are in alignment.

- Potential partners should clearly understand the others' capabilities, reputation as an alliance partner (or collaborator) and whether the initial relationship will be adversely affected by past events. During the pre-alliance stage they should negotiate for mutual value creation, understand the issues that negotiable and those that are not and understand the others' perspective on risk. Establishing any required governance procedures with the necessary flexibility and how collaboration results will be reviewed were determined as important matters by Inkpen & Li (1999).

- Understand that competitive learning approaches a zero sum game whilst collaborative learning should have a positive sum outcome. Collaborative learning occurs when alliance partners do not regard themselves as having irreconcilable long term interests (Versailles & Mérindol, 2006).

Collaboration experiences can have problems. Solved or thought through in advance, they provide guidance to another set of conditions necessary for success. In his article that examined the General Motors NUMMI alliance, Inkpen (2005) identified five key common problems to overcome.

1. Firms often fail to understand or appreciate their partners' areas of competencies. A common expectation is that the knowledge associated with differences in skills between the partners will be easily transferable *and* on a piece meal basis. Understanding why the partner knows what they know rather than how they know what they know fixes this problem.

2. There must be at least one strong learning champion in a leadership position, especially important when it comes to establishing links with potential collaborative members. Leaders are often obsessed with alliance ownership and structural issues and discount the learning opportunities (Hamel, Doz & Prahalad 1989). Solution: patience and understanding.

3. Many firms are unwilling to incur the cost of setting up and operating learning oriented systems (for instance employee exchange programs) treating these issues as costs rather than investments. Committing resources to interfirm learning may be considered as extravagant and directly related to the somewhat myopic view of current period bottom line. Lesson learned: investment in learning pays dividends.

4. Learning often dissipates as individuals involved with the alliance or collaborative find themselves unable to influence organisational change at the 'parent' level. Whilst they are expected to share their knowledge at this level, their unique insights often fall on 'deaf ears'. Issue: a cultural and change management problem.

5. The 'not-invented-here' syndrome can also derail attempts to transfer learning experiences to 'parents'. The result is that 'parent' managers often discount the value of the learning potential with a "How can the child teach the parent?" attitude. Again a cultural issue.

Last, management must understand their firm as an actor within a network of firms. Networks are between markets and hierarchies and it is difficult to completely understand a firm without understanding its relationship with others (Thorelli 1986). Establishing an efficient network implies the ability to lower transaction costs (Jarillo, 1988). The foundation of a network is in its social architecture which provides for the operating mechanisms for the many tradeoffs that must occur and for the flow of information, power and trust between members (Charan 1991). But networks also have a cost. The price of entry into the network is a limitation of the firm's ability to protect proprietary knowledge. Intellectual property rights may well reside within the network rather than at the firm level (Dyer & Nobeoka, 2000). Particularly in industries where knowledge is developing rapidly, the locus of innovation will be found in networks of learning rather than in individual firms (Powell, Koput & Smith-Doerr, 1996). Further, beneath most formal ties lies a sea of informal relations (Powell, Koput & Smith-Doerr, 1996).

The more recent interest in social network analysis has produced a different understanding of how these networks are shaped. Prior to this recent interest Gomes-Casseres (1994) observed that where a firm sits in the network determines what they get and he urges firms to position themselves strategically within and among the groups that exist.

Dyer & Nobeoka (2000) suggest that highly interconnected, strong tie networks are well suited to knowledge diffusion (exploitation) of existing knowledge rather than exploration for new knowledge which is a strength of weak tie networks. So, direct and indirect ties will positively influence innovation (Ahuja 2000) with the impact of indirect ties moderated by the level of direct ties. Direct ties serve as sources of resources and information: indirect ties for information only, but are inexpensive to maintain.

Whilst the network structure itself is a resource, there is a tendency to heightened competition between firms occupying similar positions within a network (Gulati, Nohria &

Zaheer 2000). A critical aspect of an organisation's location in a network is its centrality – the degree to which it is directly and indirectly connected to other organisations and the degree to which other organisations are connected through it. Knowledge creation occurs within the context of a community, located not so much inside organisations but rather between them. High involvement facilitates the interorganisational learning necessary to create new knowledge. It is this embeddedness that facilitates knowledge transmission beyond boundaries (Hardy, Phillips and Lawrence, 2003).

Of considerable interest to management is understanding the role of structural hole theory (Burt, 1992) in the network and the social capital theory of Coleman (1988) when trying to understand the effect network structure has on knowledge creation and flow.

Structural hole theory is about networks (or sub-networks) that are relatively open with dispersed ties. Organisations in a central position in an open, dispersed network are considered to have social capital within the network as they effectively act as knowledge brokers and controllers of information flows (Van Wijk, Van Den Bosch & Volberda, 2003). Coleman's theory of social capital focuses on closed networks with strong cohesive ties. He suggests that firms in a central location in this type of network have high levels of social capital as they are able to mobilise resources as necessary. Van Wijk, Van Den Bosch & Volberda (2003) summarise by noting that weak ties (structural holes) are most effective for searching for or transferring non-complex, easy to codify knowledge, but that strong ties (social capital theory) are necessary for transferring complex, difficult to codify knowledge because it facilitates the development of intellectual capital by providing the conditions necessary for exchange and combination of know how to occur. They conclude that knowledge complexity is an important moderator in any decision about the optimal linkage structure.

As Powell, Koput and Smith-Doerr (1996) point out, the information that passes through these networks in influenced by each participant's position in that network. Firms with access to a more diverse set of activities and those with more experience at collaboration are better able to locate themselves in information rich network positions.

Identified Best Practice

Firms that are successful in forming alliances and collaborations get the process right.

What is learned in a collaboration is profoundly linked to the conditions under which it is learned. Knowledge creation occurs in the context of a community: one that is fluid and evolving rather than static and tightly bound. Passive recipients of new knowledge are less likely to appreciate its value or be able to respond to it rapidly. In industries where know how is critical, firms must be expert at both in-house and cooperative research activities. As firms are opting for sustaining the ability to learn via interdependent relationships over independence through vertical integration, they are becoming more adept and reputed for their general practice of collaboration with diverse partners (Powell, Koput & Smith-Doerr 1996).

In utilising these networks they have established knowledge management processes and knowledge connections to access and transform that knowledge through sharing technologies, arranging for appropriate personnel movements between partners and the alliance itself, interactions between the 'parents' and the alliance and ensuring there are logical and compelling linkages between 'parent' and alliance strategies. They create the necessary connections through which managers can communicate their alliance experiences to both others in the network and within their own organisation (Inkpen 1996; Inkpen & Dinur 1998). These interactions must create an information flow that is open and visible, shared openly and simultaneously in a way that builds trust, empathy and secure relationships (Charan 1991).

They build relational capital, based on mutual trust and interaction, starting at the individual level. Close and intense interactions between individual members act as effective mechanisms to transfer 'sticky', tacit knowledge across the organisation interface. Learning is easier when the level of transparency or openness is high. This relational capital curbs opportunistic behaviours by collaboration partners due to its social control. When the inevitable conflicts arise skilful managers apply integrative conflict management procedures rather than just compromising or addressing the dispute in a distributive manner (Kale, Singh & Perlmutter, 2000).

Firms that are successful in forming alliances and collaborations establish systems for the alliance or collaboration that work.

Successful collaborations created new value together rather than through simple exchange. In doing this, those collaborations cannot be controlled only by formal systems and governance. They require a dense web of interpersonal connections (Kanter 1994). Inkpen & Currall (2004) discovered that in the initial stages of a joint venture, controls that create positive beliefs about structural assurance will foster the development of trust between partner managers. As those managers learn about each other and their organisations they are more likely to reduce their emphasis on joint venture controls and rely more on the social contract that is established. This supports Gomes-Casseres' (1994) finding that an absolute concentration on controls leads to gridlock: partners who have a scarcity outlook (and needing the controls to deal with those scarce resources) will often provoke participants to take pre-emptive action at the expense of the other partners.

Toyota provides an interesting example of systems that work. As reported by Dyer & Nobeoka (2000), Toyota heavily subsidised the production network with knowledge and other resources during its early stages. They assisted network members to create a network identity through network level knowledge sharing routines. Individual members of the network shared a shared sense of purpose, goals and values with the collective. The routines also lowered the cost of sharing knowledge within the network. Those routines included a supplier association, voluntary small learning groups (much like a community of practice (Brown & Duguid 1991)), arranged interfirm employee transfers and provided Toyota production consulting services to participant firms. In collaboration with Toyota participants in the network developed rules for knowledge protection and value

appropriation that protected the network from hiding valuable knowledge or having a free ride. One of the objectives was to minimise the level of knowledge that was considered proprietary to an individual network member.

Inkpen & Li (1999) found six important conditions precedent that relate to the formation of the venture. Partners had clearly understood objectives that were agreed with the other parties and clearly integrated with the parent's strategy. They ensured cultural compatibility existed from the outset with the roles of each partner well defined. They had defined potential exit strategies up front and established monitoring processes that would allow them to really know what was happening within the network.

Responsibility for the key best practices identified lies with senior management of participant firms.

Senior executives must define with clarity and specificity the outputs they expect of the network and clearly agree on the time frame they expect those results to be achieved in (Charan 1991). Alternatively they must have clarity about the time horizons for the alliance (Inkpen & Crossan 1995).

As well as developing, communicating and reinforcing the parties' shared goals, senior management will support the development of rules for conduct between parties, emphasising that administrative structure must facilitate rather than hinder knowledge exchanges and flows. Understanding the many potential relational differences that might exist, senior management will have assessed the knowledge sharing capabilities, operational and cultural situation of the parties and develop plans through which compatible successes can be achieved. They will ensure there is time allowed for both source and recipient to be involved in knowledge processes. Knowledge sharing success is greatly enhanced when recipients are included in the process through which knowledge is articulated and codified by the source (Cummings & Teng 2006).

Complex cognitive and behavioural changes that must occur before a learning outcome can be identified cannot be ignored by having a sole focus on alliance content. The more tacit the knowledge concerned, the lower in the organisation will be the level at which knowledge transfers will occur. Firms that focus their critical learning efforts on explicit knowledge will tend to ignore tacit-based learning opportunities, thereby increasing their propensity to undervalue overall learning potential (Inkpen & Dinur 1998).

Experience in collaborating may be thought of as a predictor of future success in collaboration. Simonin (1997) found that experience alone is insufficient for the achievement of the greatest benefits from collaboration. That experience must be internalised first and developed into collaborative know how. He found a positive correlation between collaboration experience and collaborative know how, and a positive correlation between collaboration know how and both tangible and intangible collaborative benefits. However, he found no direct link between collaboration experience and collaboration benefits, emphasising the issue that expertise in collaboration must be internalised by the firm before it is of most advantage.

The most demanding aspect of best practice in collaborations is the creation of 'ba'. This concept of shared learning spaces was first described by Nonaka & Takeuchi (1995). The 'ba' for interfirm knowledge creation must provide participants with a shared language, common metaphors and well understood routines for communication, as well as providing individuals with the freedom and security to facilitate this delicate process. Substantial investment in communications infrastructure may be required to meet these capacities (Limerick, Cunnington & Crowther 2002). These processes nurture a culture of sharing and provide a language to facilitate the exchange of ideas in an atmosphere of trust and care. The number of firms and the planned timescale of the collaborative relationship all the affect the 'ba' design (Ahmadijian 2004).

That author provides two contrasting, distinctive and successful models of 'ba' – the Toyota production network with how R&D networks in Silicon Valley operate.

	Toyota	**Silicon Valley**
Sponsorship	"Ba" is Toyota sponsored. A close, stable network of members.	"Ba" is created by the industry and region and is wide ranging and fluid.
Membership	Network membership is exclusive to Toyota suppliers.	Broad and diverse temporal networks are created.
Focus	Focuses on process and incremental innovation.	Focuses on entirely new technologies or products.
Knowledge conversion	Tacit to explicit conversion is the strongest SECI quadrant (externalisation).	Diverse forms of knowledge are combined to create new knowledge. The combination and internalisation SECI quadrants.
Parent involvement	Toyota supplies general specifications but development responsibility is with suppliers.	There are links between the firms involved as well as links to universities, research institutes and smaller firms.
Knowledge sharing	Suppliers must share the new knowledge that s created with both Toyota and other Toyota suppliers.	Firms are linked by personal relationships and shared ties with universities, venture capitalists and others.
Other characteristics	Close, interdependent, relatively stable relationships supported by concepts of equity, frequent personnel movements and a stable workforce.	Labour force of engineers and managers is very mobile. Firms are born and die in a process of Darwinian survival.

Firms that learn more effectively outperform others, but a rigid set of managerial beliefs associated with an unwillingness to cast off or unlearn past practices can severely limit the effectiveness of those learning opportunities. Firms may have explicit learning objectives and still fail to capitalise on their alliance learning opportunities (Inkpen & Crossan 1995). Creation of absorptive capacity (Szulanski 1996) through a shared mindset of 'enquiring minds' provides the culture necessary for knowledge transference.

In each of the quadrants identified by Nonaka & Takeuchi (1995) firms can provide tools to assist in each of the conversion processes described in the SECI model and support the creation of 'ba' in other than physical forms. Current (and developing) information technology assists in this process. A review of technological tools is beyond the scope of this paper, but Nonaka & Nishiguchi (2001) note that the combination quadrant of the SECI model is most effectively supported in collaborative environments by IT. This technological shift enhances the importance of this conversion mode.

Best practice also involves ensuring the firm is in an appropriate place in the network of firms in which they exist. The greater a firm's centrality in the network of relationships and the greater the experience the firm has in managing relationship ties and any given time, the more rapid the firm's subsequent growth and the greater its number of subsequent collaborations (Powell, Koput & Smith-Doerr 1996). This network position provides rich opportunities and as individuals interact through these various connections, the interactions become larger in scale and faster in speed as more actors become involved (the size and rate of rotation of the SECI spiral). As noted by Nonaka & Takeuchi (1995), this generated knowledge starts at the individual level, moves up to the group and then firm levels and is then available past the firm boundary. As it spirals, it is enriched and extended as individuals interact with each other and within and without their organisations (Inkpen 1996).

Challenges for management

As the nature of staff roles and job skills continues to change and personnel within organisations change more often, relationships that may at times become fragile must still be managed (Kanter 1989). In this environment, a key management challenge is the establishment and maintenance of a dynamic 'ba'. Part of that process is establishing the knowledge vision that accompanies it. That vision will define what kind of knowledge the company should create, the domain in which it should be created, the value system that will evaluate and determine the quality of the knowledge created and give direction to the knowledge creation process and the knowledge created by it (Nonaka & Nishiguchi 2001).

They enumerate management roles involved in this process. Top management must articulate the knowledge vision and communicate it strongly throughout and outside the firm. That articulated vision should transcend the boundaries of existing products, divisions, organisations and markets. Middle management's role is to break down the values and visions of the knowledge vision into concepts and images that can guide the knowledge creation process with vitality and strong direction, 'remaking' reality according to the vision.

Particularly in the traditional western culture, the largest single challenge management faces lies in the development of the collaborative individual within their firm. In an environment of a relatively mobile workforce, this has to be achieved where the time spent in a position is reducing year by year.

In this environment, career path planning is now the responsibility of the individual employee and an opportunity for the firm. Assisting employees to map their assets and their empathetic or intuitive capabilities and developing their personal marketing and negotiation skills is role relatively new to many firms. So that individual and firm objectives can be met simultaneously, individual contracts should then be developed through objectives negotiation. Supported by an atmosphere of information openness and empowerment, this collaborative individual is ready to accept their role in a dynamic, ever-changing network of individuals and firms (Limerick, Cunnington & Crowther 2002).

The most difficult challenge for firm management is dealing with three, interrelated philosophical issues that arise from participating in a network.

The fact that networks consist of sovereign units may lead to inadequate network design and resourcing, particularly if network survival is not critical to an individual firm's survival (Kanter 1989; Limerick, Cunnington & Crowther 2002). Managers may have to manage the tradeoff between providing resources for their own firm and for the network (where other firms will also benefit).

Particularly when network outcomes are evaluated on myopic financial results rather than longer term strategic objectives problems can occur when asymmetries arise in alliance inputs and outputs (Kanter 1989) but trust and carefully negotiated and understood relationships can overcome these issues (Limerick, Cunnington & Crowther 2002). A shared understanding (within all echelons of member firm management and between firms) of what alliances are intended to achieve, why they were formed and how they will flourish is critical in dealing with temporal, asymmetric outcomes

Network governance based on relationships lowers transaction costs and facilitates adaptive responses, requiring less effort than formal governance procedures (Faems et al 2006) but we are taught that "good fences mean good neighbours" and even though it might be understood that alliances are best described as incomplete contracts western managers have a tendency to try and cover all potential uncertainties in a written form (Anand & Khanna 2000). Developing a balance between relational and contractual governance, and treating them as complements rather than substitutes is a challenge. Contractual obligations that define a collaborative process (rather than content), and that are characterised by intensive information sharing between the parties, create this balance between relational and contractual governance (Faems et al 2006).

Given the research and results to date on inter-firm collaboration, the significance of knowledge creation and management is apparent to the advancement of leadership and management. Like knowledge creation and management itself, leaders with a vision must be effective communicators and managers with a mission to collaborate must be efficient.

As individuals, work groups and organizations, best practices must be created, shared and managed wisely. Understanding the opportunities and knowing the hurdles to develop innovation networks would not be possible without all the prior knowledge leadership and management.

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